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GEOLOGY AND PALÆONTOLOGY.

MR. RAND ON THE GEOLOGICAL SURVEY OF CHESTER AND DELAWARE COUNTIES, PENNA.—In Mr. Rand's communication he erroneously supposes that he is referred to as "skipping from his second to his third belt" of serpentine. The context makes it clear that it was the other and earlier geologist, Rogers, who is meant; the misprint of "when" instead of "where" (very often made by printers of this writer's MS.) may have clouded the meaning. He is in error in quoting as the writer's words, "approximately parallel beds." No such words occur on p. 523 or elsewhere. It was far from the writer's intention to criticize Mr. Rand for describing serpentine areas. His labors of love in mineralogy and geology are too valuable and too well known to the writer, but it was intended to defend Mr. Hall from what seemed to the undersigned an unjust accusation of carelessness and incompetency.

The writer has casually seen some serpentine outcrops in Lower Merion, but has never seriously studied them. At this time, while many miles away from both serpentine and notebooks, he cannot vouch for what he might be able to prove in Lower Merion, Radnor or Upper Merion. He has little doubt, however, that he could find there, as he has in other counties, areas of serpentine of which no two field geologists would give the boundaries alike, and rocks which the most experienced lithologists would find it difficult to name and classify. The writer not having seen "masses of sand rocks of tons weight" in place where Mr. Rand supposes the Potsdam to be, cannot express an opinion, but if the evidence is there he will be glad to accept it, nor will it in any way affect his theory of the structure.

There is nothing in the language to which Mr. Rand refers without quoting, to justify his "if it is intended to convey the impression that I was guilty of plagiarism," &c., it may be ascribed to a desire to have a pretext for his joke. The art of assuming a fact, if you cannot find it, for rhetorical purposes is one of the characteristics of the bar. At the same time, up to the moment of reading Mr. Rand's remarks, the writer was under the impression that C_6 was published at the time he stated, and that impression is fully confirmed by a communication from Mr. F. W. Forman, of the geological office in Harrisburg station, that the "first issue of C_6 was October 24, 1882."

In Mr. Rand's didactic passage about natural science the writer follows him, simply repeating that he has neither "rejected, belittled nor ignored" Mr. Rand's work. What he has done is to point out the injustice of condemning the results of a fellow-worker in science, apparently because he does not happen to share his views.

In conclusion, the writer would suggest that there are worse things that might happen to the Geological and Mineralogical

Section than the awful fate Mr. Rand hints at.—*Persifor Frazer, Sea Girt, Aug., 1883.*

ATMOSPHERIC DUST AND DISEASE GERMS.—At a recent meeting of the San Francisco Microscopical Society Mr. H. G. Hanks read a paper on "Some notable features of the great San Francisco snow storm of December 31, 1882."

A storm of brief duration, resulting in the fall of a few inches of snow, would attract but little attention should it occur in the Eastern or Northern States of the Union, but at San Francisco, where such phenomena are almost unknown, the only instance on record during half a lifetime naturally became the absorbing topic of conversation. When, however, the warm air dissipated the snow and the streets of the city assumed their usual appearance, the wonderful snowstorm was forgotten. Apart from the storm being unusual and remarkable, there were certain features connected with it, both interesting and important, which, no doubt, escaped the notice of the casual observer, but to which my attention was drawn by accident. While the snow was falling, to all appearance clean and white, the idea occurred to me that it afforded an opportunity to obtain, without much trouble, a stock of pure water for chemical purposes. With this view I melted a quantity in a tin vessel in my private laboratory. To my surprise I found the resulting water milky, a deposit or residue of a muddy character remaining in the can. Without at first attaching any importance to the circumstance, I proceeded to filter the water, but found the filtrate still milky. Thinking the matter over, I determined to examine the residue under the microscope, when I found that I had in the field of the instrument finely divided sand, very much resembling that of the Great Colorado and Mojave deserts, with which I had become familiar in the course of recent microscopic investigations. With this clue I submitted the fine sand to a closer examination—mechanical, chemical and optical.

Under the microscope the dust was seen to be composed of rounded particles of quartz, with minute scales of mica, or jefferisite, and a large quantity of organic matter, principally vegetable fiber. On being calcined in a platinum dish, it at first burned, then blackened, and on continuing the heat to incineration, the mineral portion only remained, including a small ash. On cooling, the loss was found to be eighteen per cent, independent of moisture. The particles, measured with a Jackson micrometer, showed the larger to be 0.002 in., and the smaller 0.00005 in. in diameter. Thinking that some of the garden soil might have been taken up by accident, to remove all doubt I made a comparative examination to prove that the foreign matter in the snow did not come from that source.

While I was making these experiments a telegram appeared in the city papers announcing a " shower of mud" at Fresno, which covered everything with a coating of gray, sandy mud. I immediately wrote to the telegraph operator, and received an answer and a sample of the mud or dust. An examination showed this substance to be nearly identical with that found in the San Francisco snow, the only important difference being that the particles were larger and the vegetable fiber more abundant.

About the same time L. Figuera, of Modesto, called at the Mining Bureau, and in answer to inquiries made by me, stated that the snow which fell at Modesto was discolored. On his return he sent me some of the dust which fell with the snow. Ten years ago snow fell at Modesto one inch deep, since which none has fallen. On the occasion of the great snowstorm the fall was seven inches, but the weather was so mild that no damage was done to animal or vegetable life.

The Modesto sand sample was found to be of the same general character, but the particles were larger than the others mentioned, and the organic matter was less, as follows:

Organic matter	14.4 per cent.
Largest particles	0.19 in.
Smallest particles	0.001 in.

The papers announced a sand storm at Bakersfield, and falling sand at Virginia city; soon after there was a sand storm in the Mohave desert, and at the same time a similar storm of great violence in Death valley, Inyo county, but all these occurred after the San Francisco storm and cannot be directly connected with it. A sand storm in a great desert is sometimes a serious matter; and although life be not in actual danger, the personal inconvenience is very great. It has been my fortune to experience more than one of these storms. The strong wind sweeping across the wide valleys lifts the sand in clouds which obscure the light of the sun, causing an unnatural gloom to hang over the landscape, which is at times wholly shut out from view.

Dust from the deserts of Africa has frequently fallen on the decks of ships in the Indian ocean and the Red sea, and on the summits of the highest accessible mountains, on the snow and even on the bare rocks, dust has been observed which has been called "star dust," "cosmical matter" and other similar names, which probably owe their origin to the causes I have mentioned.

The subject of atmospheric poison becomes important when it is considered that the dust I have examined contained so large a quantity of organic matter, of which, without doubt, a considerable part was in the form of germs. May it not be that the sudden and otherwise unaccountable appearance of strange plants, fungi and low forms of vegetable life, and perhaps diseases, may be due to this cause?

It is well known that on the most arid portions of the Colorado desert, when accidentally irrigated by the overflow of the river, a dense and luxuriant growth of vegetation springs up from seeds and germs which must have lain dormant for many years.

Certain localities in California have become unhealthy on the introduction of water for mining purposes or irrigation, and in many cases the country, before healthy, has become almost uninhabitable from this cause. May not the same effect be produced by germs brought by the winds? I leave the answers to these questions to members of our society who have made a special study of disease germs, and will conclude with a calculation I have made of the quantity of dust that fell in San Francisco, based on the weight obtained and quantity of snow, as found in my experiments. Of course such a calculation can only be roughly approximate. Without going into details, my calculation gives seventy-five tons to the square mile, supposing the fall to have been uniform. It is fair to assume that the upper air is frequently charged with dust, a portion of which falls near the source, while a larger portion is carried to unknown localities, and that the falling snow on the occasion of the December storm gathered it together and deposited it in our streets.

Dr. Sternberg addressed the society upon the points presented in Mr. Hanks' paper. He said he had spent much time in microscopical examination of atmospheric dust both in Havana and New Orleans, where he was studying the yellow fever and its communication. He found in the air spores of fungi foreign to the locality, which must have been brought great distances. This fact was also observed by Cunningham at Calcutta. Common air frequently contains, he said, starch granules and epithelial cells from the human skin, also fragments of cotton and wool fiber, &c. The first rain or fall of snow after a season of drought brings down all these matters from the air. In fact, the first rain gives the sewage of the atmosphere. Michel, in Paris, found the air loaded with germs of many kinds. He also found that filth diseases are most prevalent when the air contains most of these germs. But by all these air studies, conducted even in time of plagues, there has been no discovery which would connect certain diseases with any certain germ.—*English Mechanic.*

THE PROGRESS OF THE UNGULATES IN TERTIARY TIME.—At the late meeting of the American Association for the Advancement of Science in Minneapolis, Professor E. D. Cope read a paper on the Evidences of Evolution. Among the evidences cited were those furnished by the Ungulate Mammalia whose development since the beginning of Tertiary time (the Puerco epoch) is so distinctly marked in the skeleton and the brain. He gave a synopsis of these in tabular form as follows:

FORMATION.	NO. TOES.	FEET.	ASTRAGALUS.	CARPUS AND TARSUS.	ULNO-RADIUS DISTALLY.	SUPERIOR MOLARS.	ZYGAPOPHYSES.	BRAIN.
Miocene Upper .... (Loup Fork.)	1—1 2—2 3—3 4—4 (5—5)	Digitigrade. (Plantigrade.)	Grooved. (Flat.)	Interlocking. (Opposite.)	Faceted.	4-tubercles, crested and cemented.	Doubly involute. Singly do.	Hemispheres larger, convoluted.
Middle .... (John Day.)	2—2 3—3 4—4	Digitigrade.	Grooved.	Interlocking.	Faceted. Smooth.	4-tubercles, and crested.	Singly involute. Doubly do.	Hemispheres larger, convoluted.
Lower .... (White River.)	3—3 4—3 4—4	Digitigrade. Plantigrade.	Grooved.	Interlocking.	Smooth. Faceted.	4-tubercles, and crested.	? Singly involute.	Hemispheres small, and larger.
Eocene Upper .... (Bridger.)	3—3 4—3 4—5 5—5	(Digitigrade.) Plantigrade.	Grooved. (Flat.)	Opposite. Interlocking.	Smooth.	4-tubercles. 3-tubercles, and crested.	Singly involute. Plane.	Hemispheres small.
Middle .... (Wasatch.)	4—3 4—5 5—5	Plantigrade. (Digitigrade.)	Flat. (Grooved.)	Opposite. Interlocking.	Smooth.	4-tubercles. 3-tubercles, a few crested.	Plane. (Singly involute.)	Hemispheres small; mesencephalon sometimes exposed.
Lower .... (Puerco.)	5—5	Plantigrade.	Flat.	Opposite.	Smooth.	3-tubercles. (4-tubercles) none crested.	Plane.	Mesencephalon exposed; hemisphere small and smoother.

The primitive type remaining in the Loup Fork epoch is the Proboscidia.

GEOLOGICAL NOTES.—*Jurassic.*—M. Cotteau, in the sixty-sixth issue of the *Paleontologie Francaise*, describes the Jurassic species of the echinid genera Hemipedina and Cyphosoma. The latter genus attains its greatest development in the Turanian and Senonian stages of the Cretaceous, and is rare in the Jurassic.

Tertiary.—In Palæontological Bulletin, No. 36, Professor Cope adds to the fifty-five species of vertebrates of the Puerco epoch the ophidian *Helogras prisciformis*, and the mammals *Triïsodon levisianus*, *Mioclænus ferox*, *M. bucculentus*, *M. subtrigonus*, and *M. corrugatus*, two species of Mixodectes, new species of each of the genera Periptychus and Phenacodus.——MM. Schlumberger and Munier-Chalmus have proved that two species of Biloculina, now living in the Atlantic, are dimorphic, and have since ascertained that several Eocene Miliolidæ (Triloculina, etc.) are also dimorphic. The dimorphism, present in all the Miliolidæ examined, consists of a central chamber much smaller and surrounded by a greater number of chambers than the usual form. No young individuals of this second form have yet been found, and this fact tends to show, what from the character of the change is quite possible, that the form B is a final evolution of the form A.——Mr. J. L. Wortman, of Philadelphia, has published in the *Revue Scientifique* a most thorough account of the genealogy of the horse, illustrated with numerous engravings. Beginning in the Lower Eocene, he traces upwards the equine line through animals belonging, by the structure of their feet, to the Taxeopoda through the Lophiodontidæ, Chalicotheridæ and Palæotheridæ to the true Equidæ. The first traces of the preponderance of the central digit are found in the taxeopod Phenacodus; Hyracotherium follows, and the line then passes through the chalicothere Lambdotherium to Anchitherium, in which Palæotherid the foot has assumed an almost equine form. This genus belongs to the lower and middle Miocene, and in the beds immediately above it occurs Hippotherium, the incomplete fibula, small exterior digits, consolidated radius and ulna and horse-like teeth of which approximates it to Protohippus and to the true Equidæ, which follow in the upper Miocene, Pliocene and recent strata.

General.—Professor Hulke, in his anniversary address, reviews the work done during the year by the Geological Society. He notes as subversive of once generally received theories the fact that a much older fauna was found in the lowest of three gravel terraces in a river valley near Paris, than was afforded by the highest terrace; and also the illustrations repeatedly enforced to disprove the power of glaciers to excavate rock-basins.——Professor T. McK. Hughes has written graphically upon the relation of the appearance and duration of the various forms of life upon the earth to the breaks in the continuity of the sedimentary rocks. Postulating an earth-wave which should gradually force southward the depression of the Mediterranean, and thus convert Africa slowly into Europe, he endeavors to show what forms of life would be likely to persist. He then reviews some of the appearances and extinctions occurring in the various formations, and concludes that the sequence of life upon the earth points to the persistence of oceanic and continental areas, and to earth-movements of the nature of waves. The greatest breaks in the series of strata in England are those between the upper and lower old red sandstone, and between the Coal Measures and the Permian.

MINERALOGY.[1]

THE INFLUENCE OF LIGHT ON MINERALS.—It may not be generally known that many minerals lose their color or fade when exposed to light. Experienced collectors frequently keep their most finely colored specimens in a dark place. Fluorite is especially liable to fade. Amazon stone, however, sometimes gains in color when exposed to light. A greenish-gray feldspar from the graphic granite veins at Ammeberg has been found to assume a bright emerald green when exposed to the air. Experiments made by Erdmann, by placing fragments in sealed tubes and exposing them to light for a year, led to the conclusion that air and moisture had no influence, but that light alone effected the change in color.

RUTILE IN PHLOGOPITE.—The beautiful phenomenon of asterism is probably better shown in the well-known phlogopite of Burgess, Ontario county, Canada (often known as "star-mica"), than in any other substance. The flame of a candle looked at through a plate of the mica, appears as a six or twelve rayed star. As is shown by the microscope, this is due to the presence of minute linear crystals which cross each other at angles of 60°. The cause is the same as that which produces a two or four-rayed figure when a street lamp is looked at on a rainy night through an umbrella.

Mineralogists have long been puzzled to know precisely what these minute enclosed crystals are which thus produce the asterism, and they will be interested to know that they consist of *rutile.*

The needles are flattened and almost colorless in the Canadian mica, but in a mica from Bodenmais, Sandberger has found them of a deep reddish-brown color. Williams has also recently found needles of rutile in a magnesian mica which occurs in a mica diorite from the Black Forest.

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[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.